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**U.S. MEAT ANIMAL
RESEARCH CENTER**

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North Central Region
Agricultural Research Service
U.S. Department of Agriculture
Clay Center, Nebraska 68933

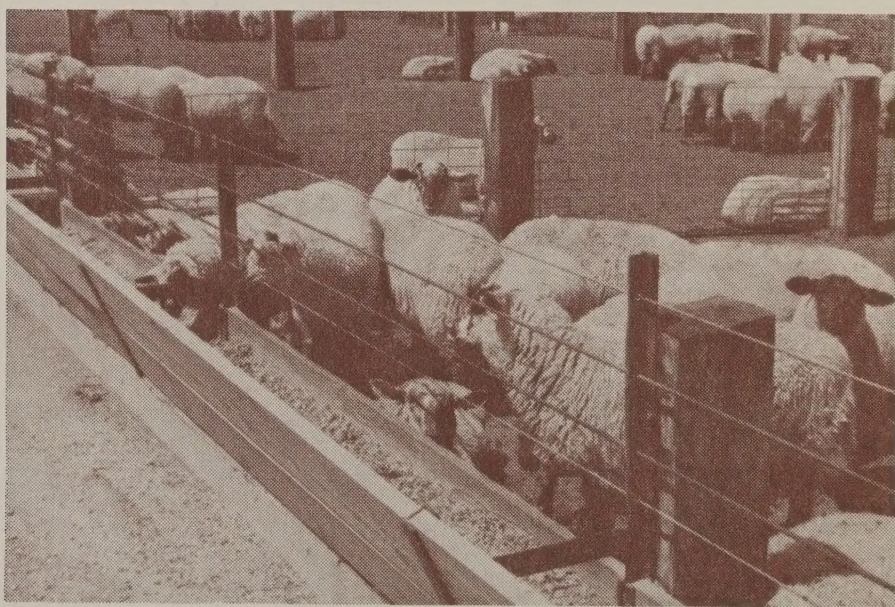




Research feedlot for beef cattle has a capacity for 6,500 experimental animals.

The U.S. Meat Animal Research Center (USMARC) is developing new technology for use by the meat animal industries to increase the production of high-quality, red meat per unit of production resource use. Development of land and associated resources began in 1966. When completed, the 35,000-acre Research Center will provide resources for a comprehensive research program that will involve approximately 100 scientists and 300 support personnel. Facilities provide for both intensive laboratory investigations and extensive investigations on beef cattle, sheep, and swine production.

Approximately one-half of the research is devoted to beef cattle, one-fourth to sheep, and one-fourth to swine. Research program objectives will



Research feedlot for sheep has a capacity for 2,500 experimental animals.





Gilts are being individually fed in stalls to measure feed consumption.

require breeding-age female populations of approximately 7,000 cattle, 7,000 sheep, and 500 swine litters per year.

The Research Center is administered by the Agricultural Research Service, U.S. Department of Agriculture. Research programs are conducted in cooperation with the Agricultural Experiment Station of the University of Nebraska and with other agricultural experiment stations of land-grant Universities. Collaborative efforts with State agricultural experiment stations and with other Agricultural Research Service programs represent an integral part of the comprehensive research program.

Research Center Growth

Development has included the establishment of more than 30,000 acres of cool- and warm-season pastures. Approximately 300 miles of fence and livestock water facilities have been provided for more than 200 pastures. Over 5,000 acres are required for irrigated silage and hay production. Experimental feedlots for cattle and sheep and facilities for breeding herds and flocks are essential components of the physical plant for the comprehensive research program.

Construction and development is progressing in three phases: Phase I facilities provide a physical plant for 44 animal scientists (42 ARS and 2 University of Nebraska) and about 175 support personnel. An office-laboratory building and an animal laboratory building for intensive investigations were completed in January 1971. Animal and service buildings provide facilities for more intensive beef cattle and sheep investigations and



for the swine research program.

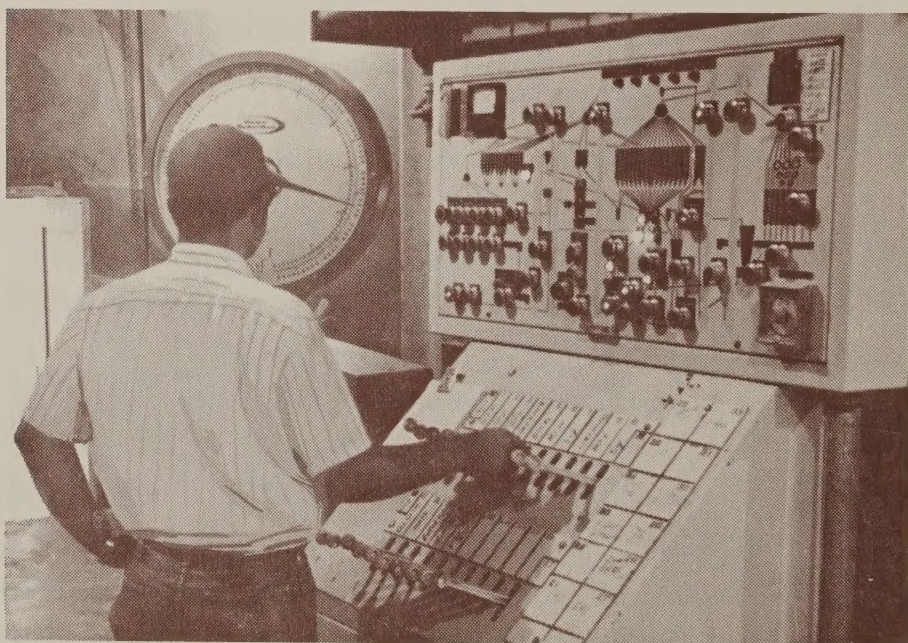
Phase II construction plans include an abattoir and meats research laboratory and livestock engineering research facilities. Research programs will require an additional 25 scientists and about 60 support personnel.

Phase III will provide facilities for a comprehensive and integrated research program of producing, harvesting, handling, storing, and using forages. Phase III programs will need 35 additional scientists and 65 support personnel.

Research Program

The research program at USMARC is organized on a multidiscipline basis and is directed toward providing new technology for the livestock industry. The USMARC research program complements research conducted elsewhere by the U.S. Department of Agriculture and State agricultural experiment stations.

An Advisory Committee assists in identifying major problem areas and in assigning priorities to research programs. This Advisory Committee includes representatives from several segments of the beef cattle, sheep, swine, and related service industries. Also, USMARC has a Technical Collaborators Group of scientists from other research organizations that provide advice and counsel on technical matters relating to research program planning and execution.



Control panel activates equipment in modern feed processing center.





Radioimmunoassay is used to measure hormones influencing reproduction.

Scientists are investigating major biological, physical, and managerial factors that influence production efficiency in all segments of the production cycle for beef cattle, sheep, and swine. The comprehensive multidiscipline research program includes investigations on genetics and breeding, nutrition, reproduction, meats technology, life cycle management systems, animal housing and facilities, waste management, as well as producing, harvesting, handling, storing, processing, and using feeds. New knowledge evolving from these programs will contribute toward optimizing resource use by the beef cattle, sheep, and swine industries considering production and economic situations and technological developments.

Research Areas

Genetics and Breeding

The primary objective of genetics and breeding research with beef cattle is to determine optimum performance capability for different feed environments and production situations. Genetics and breeding research with sheep relate to opportunities with intensive management systems; emphasis is on reproduction rate and the production of heavy

Continued



lamb carcasses with a desirable lean-to-fat ratio. For swine, breeding research, highly integrated within other research areas, relates to reproduction rate, feed efficiency, carcass composition, and meat quality.

Research in the genetics and breeding area is fully integrated with research in the areas of reproduction, nutrition, carcass and meats, and management systems. Efforts are directed toward developing procedures for more effective utilization of both additive and nonadditive genetic variation in cattle, sheep, and swine. For cattle, emphasis is on developing an understanding for synchronizing the germ plasm capability to specific feed and other resource situations involving such traits as growth rate, shape of growth curve, composition of gain, cow size, and milk level.

Reproduction

The objective of the reproduction research program is to develop the technology necessary for increasing the number of market animals produced per reproducing animal. Because of high fixed resource requirements associated with maintenance of the nation's breeding beef cattle, swine, and sheep, small increases in reproduction rate have a large effect on resource requirement per unit of production and, thus, on the efficiency of red meat production.

Research on reproduction includes both sexes and involves the disciplines of physiology, endocrinology, neurology, biochemistry, nutrition, and



Research Center demonstrated that hybrid vigor is of major economic importance in beef cattle.



genetics. Increased understanding of factors that influence puberty, estrus, ovulation, fertilization, implantation, embryonic and fetal mortality, parturition, and early postnatal mortality is required for improving reproductive efficiency.

Nutrition

The objective of nutrition research is to develop technology that can be implemented into production programs to increase the amount of high quality, edible meat per unit of available feed resource. Improvement in feed use at all stages of the life cycle by increasing use of nutrients from feeds, increasing efficiency of metabolic processes related to animal maintenance, and the synthesis of edible product has great potential for reducing production costs for the beef cattle, sheep, and swine industries.

Research relating to improving feed efficiency involves the integration of genetics, biochemistry, nutrition, microbiology, and physiology and the variables related to appetite, maintenance, digestion, metabolic processes, tissue deposition, and to the physical and chemical treatment of feeds.

For cattle, emphasis is on developing optimal feeding programs for growing-finishing and reproducing animals representing a wide range of biological types.

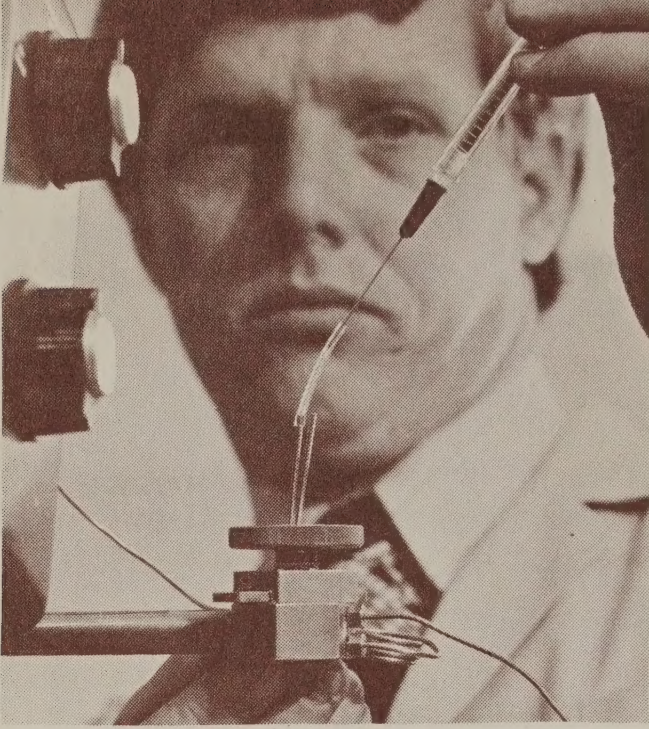
For sheep, attention is on developing optimal feeding programs for females with a high-reproductive potential and for market lambs with a high-growth potential to heavy market weights.

For swine, nutrition research efforts focus on meeting nutritive requirements for maximizing reproduction rate and the production of high-quality pork per unit of feed resource use.

Carcass and Meats

Unfavorable lean-to-fat ratio is a major problem in beef cattle, sheep, and swine carcasses. Excessive amounts of fat trim greatly increase production costs per unit of edible product. The objective of carcass and meats research is to develop technology to reduce the amount of fat per unit of edible product while maintaining or improving palatability of the edible product.





High-pressure liquid chromatography helps determine end products of metabolism.

Genetic, nutrition, and management factors that influence rate of development of different tissues, distribution of fat and lean, and meat palatability are receiving attention. Gaining an understanding of the factors that influence palatability of meat and the proportion of edible meat in the carcass is a primary aim of this research.

Animal Waste Management

Pollution has been identified as a national problem. The development of feasible technology for managing animal waste to maximize its value and elimination of the threat to air and water pollution is the objective of this research program. Research is being conducted to identify the nature and magnitude of the pollution problem associated with beef cattle, sheep, and swine production.

Physical Environment

Research in this area is designed to determine the importance of major factors related to the physical environment and to develop procedures for improving the environment to increase red meat production efficiency.

All livestock are housed, sheltered, or confined in some manner. The system that is used forms the physical environment. This environment defines the degree of shelter from adverse climatic factors, space per animal, group size of animals, labor efficiency of feeding and caring for animals, ability and cost to manage animal wastes, and other factors





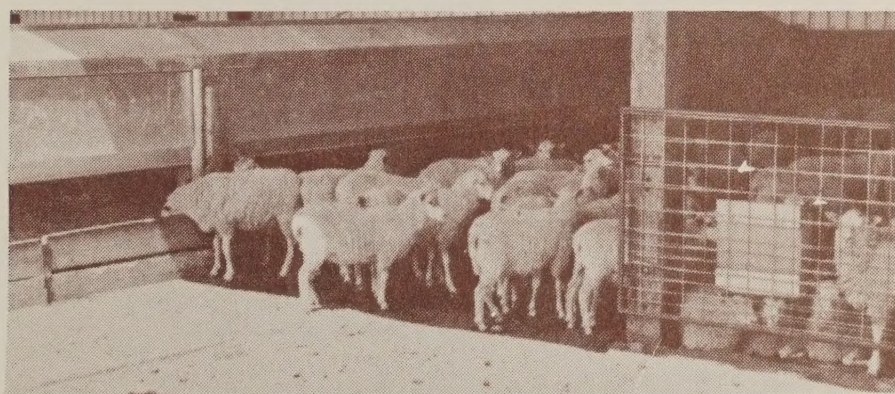
Pigs are group fed in swine growing-finishing unit to evaluate the effects nutrition and genetic factors on rate and efficiency of gain and carcass quality.

involved in management. Physical environment has a direct influence on the production efficiency of beef cattle, sheep, and swine. With labor efficiency and livestock waste management considered, the physical environment is an important area for increasing meat animal production efficiency.

Management Systems

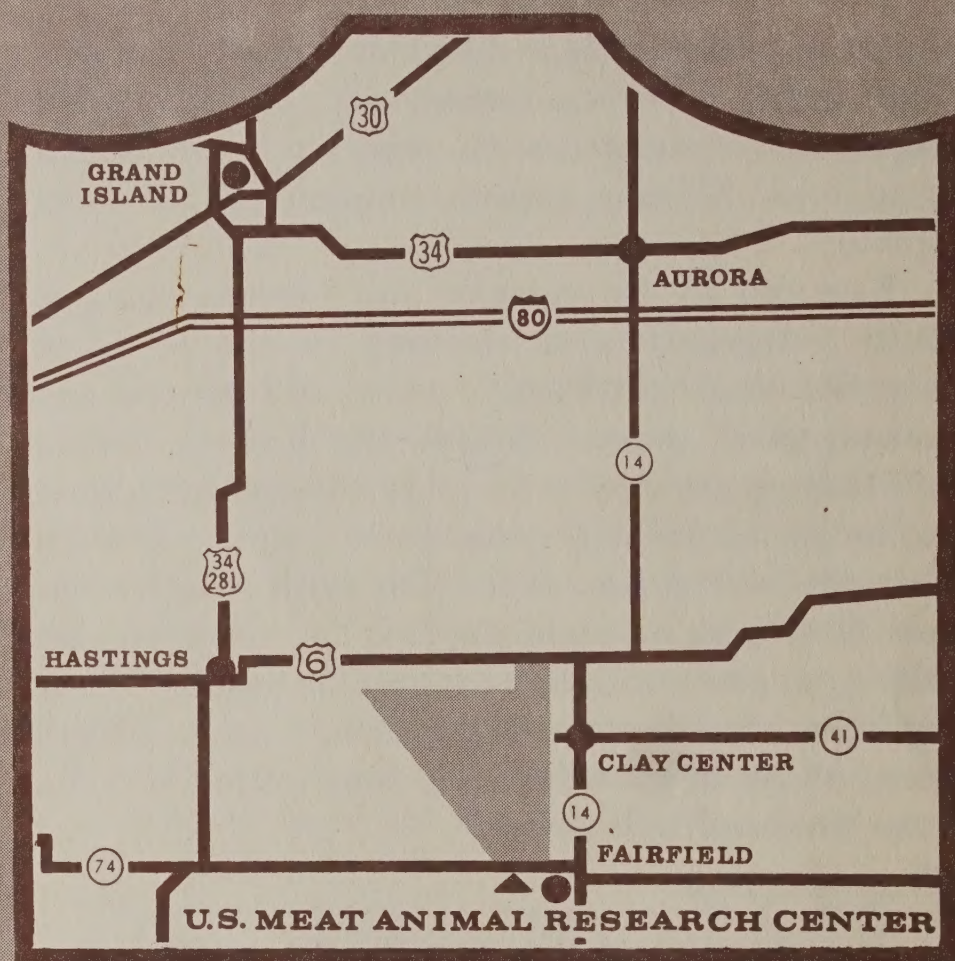
The objective of this program is to develop an understanding for maximizing resource conversion rate for a wide range of production resource situations through appropriate adjustments in the management system.

The number of variables (economic, biological, and physical) that affect livestock production continue to increase and become more complex. Alternatives available to increase efficiency become more numerous and dependent on specific economic and production situations. Research in this area focuses on identifying and quantifying major factors affecting production efficiency and returns to capital and management to provide for more optimum use of resources in different production and economic situations.



Research Center investigations show that Finnsheep have a great potential for increasing reproduction rate.

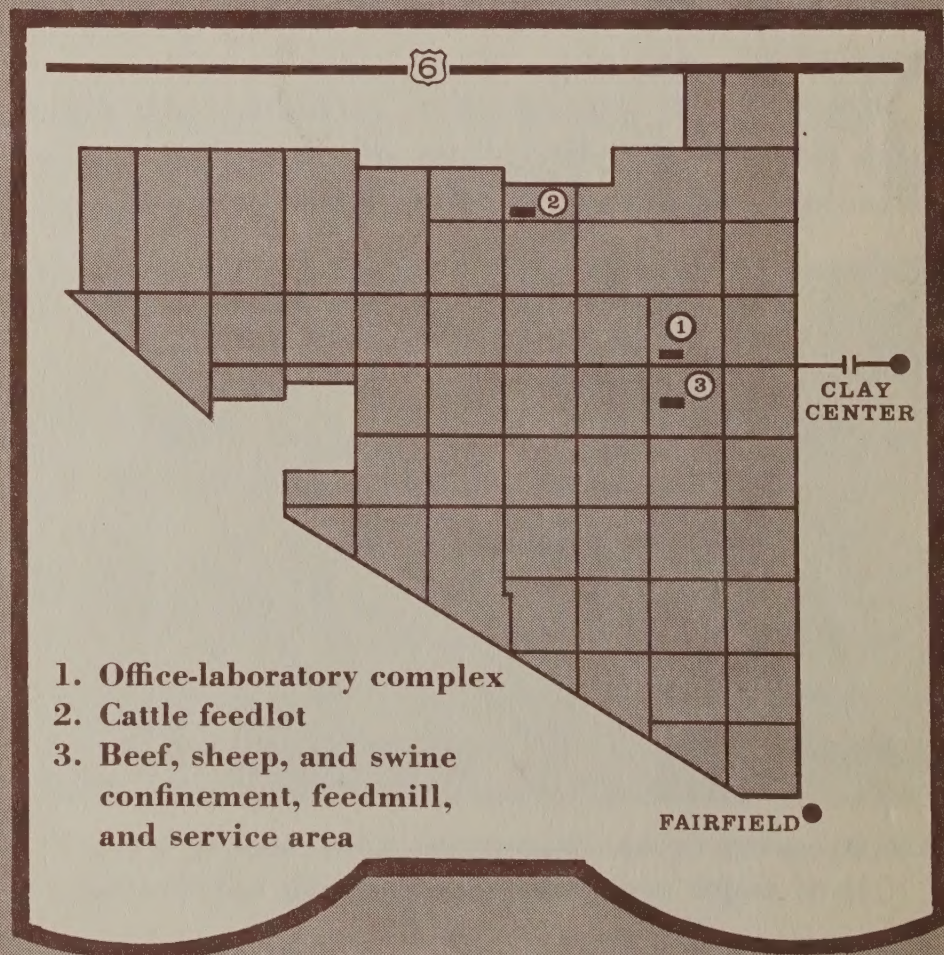




Location

The primary entrance to the U.S. Meat Animal Research Center is located 3 miles west of Clay Center, Nebraska.

Visitors are welcome during working hours 8 a.m. to 4:30 p.m., Monday through Friday.



1. Office-laboratory complex
2. Cattle feedlot
3. Beef, sheep, and swine confinement, feedmill, and service area

